AD NUMBER

ADB952263

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

Distribution limited to U.S. Gov't. agencies only; Test and Evaluation; 4 Mar 81. Other requests for this document must be referred to Commander, Naval Sea Systems Command, Attn: SEA-63R15. Washington, DC 20362.

AUTHORITY

ONR ltr., Ser 93/160, 10 Mar 1999

12856
9 FEB. 70

UNANNOUNCED

Unclassified
B
+E

Code No. ________

Copy No. 51

(16) SR10403

(17) SR1040301

NUSL Problem No.
0A0000300100
SR 104 03 01-12856

0 SC

NAVY UNDERWATER SOUND LABORATORY
NEW LONDON, CONNECTICUT

(6) BIOLOGICAL DATA COLLECTED ON THE PARKA I TRANSIT.

DTIC
ELECTE
MAR 10 1981
S D
A

by

(10) David Giuliano

(14) NUSL-TM-

(9) NUSL Technical Memo[redacted] No. 2213-262-69

(11) 23 Oct[redacted]r [redacted]69

(12) 15

AD B952263

INTRODUCTION

The investigation into the Deep Scattering Layer (DSL) of the world's oceans has become widespread with much data already collected (Backus Hersey, 1966). Although more data is needed, future research should involve a coordinated effort between acousticians taking reverberation data, and oceanographers taking biological data. In line with this thinking NUSL initiated a sampling program on the transit of the USNS SANDS from New London, Connecticut to Honolulu, Hawaii, (1 July 1968-2 August 1968. Acoustic and biological data was obtained concurrently at 10 stations along the cruise track (Figure 1) to assess the geographic distribution of reverberation and the influence of the biological community on this distribution.

METHODS

It was planned to utilize a newly designed net, The Micro Nekton Net, but at the last minute, a malfunction necessitated its removal from the ship and instead an open 10 foot Isaacs-Kidd Midwater Trawl (IKMT) was used. The Micro-Nekton Net would have allowed 3 discrete samples from each depth or one discrete sample from each of 3 depths. This feature would have allowed a quantitative assessment of the biomass of different portions of the DSL, and of the migrating vs non-migrating segments of this layer. The use of the non-closing single sample IKMT necessitated

81 2 10 257 29 10 69

254200

one oblique haul where the depth from which the animals were captured and the precise concentration remained unknown.

Since silent ship conditions were required for the acoustic tests, the net tows were taken immediately after the acoustic tests. All tows except Station 1 were made just after sunset and were of 3 hours duration. The procedure was to lower the net to the bottom of the DSL and begin towing. The net would tow for 30 minutes at each of five equally spaced depths from the bottom of the DSL to the surface. At Station 1 a deep day tow was undertaken. The net was lowered at 0930 local time. It reached a depth of 850m at 1200 hrs. and after 30 minutes at that depth was retrieved slowly reaching the surface at 1430 hrs.

The samples were preserved in 10% formalin and stored for later laboratory analysis. Upon return to NUSL the animals were identified according to taxonomic groups; the more important scatterers were identified to species.

Depth monitoring of the net was accomplished with a Benthos depth-telemetering pinger which sends out two acoustic pulses. The time between the pulses measured on an oscilloscope, indicates the depth. A Benthos time-depth recorder (TDR) was also attached to the net for a permanent record of depths samples.

RESLTS AND DISCUSSION

As shown in the tables of results, all samples were taken at night between the bottom of the DSL and the surface except for the sample at station 1 which was taken during the day at depths of 850m to the surface. It should be noted, however, that the figures for number of animals per $1000m^3$ are minimum numbers. These numbers were calculated assuming a homogeneous distribution over the whole sample range from the deepest sampling depth to the surface. Since these animals are known to occur in shallow bands perhaps only 10-50m thick these numbers may under-estimate the population of scatterers by as much as an order of magnitude or more. Except for station 1, the Tables show the mean size of the swim bladder for all animals possessing one.

The data shows that the Myctophids were present at each station. Over the whole series of stations, these known scatterers were the most consistent single contributors to scattering. Among the other scatterers, Argyropelicus spp., the hatchet fish, were caught in small numbers, 0.013 per $1000m^3$, at station 6 (Table 5) and in very large concentrations, 1.13 per $1000m^3$, at station 4 (Table 3). Station 4 was found to have relatively high scattering strength, -65db at 13.5 kHz (Dullea and Cron, 1969), compared to other stations, which undoubtedly was caused by the hatchet fish with a lesser contribution from the

Myctophids. At station 5 the greatest concentration of scatterers occurred. At this station an air bladdered fish, Vinciguerria attenuata, was present in very large numbers, 5.11 per $1000m^3$. Myctophids also occurred here in the greatest concentration of the whole series, 0.499 per $1000m^3$ (Table 4). Present in very large numbers were Euphausiids, 2.7 per $1000m^3$, and the Galatheid crab, Pleurencoides planipes, 15.48 per $1000m^3$, but their relative contribution to scattering is not known. At this station Dullea and Cron found the greatest reverberation of any of the stations, -50db at 13.5 kHz. At station 6 the reverberation fell back to the low level which was found at most of the stations along the track, -80db-70db at 13.5 and 15.5 kHz. The numbers of fish, in this case Myctophids, 0.094 per $1000m^3$, and Vinciguerria attenuata, 0.313 per $1000m^3$ also were much less than at either station 4 or 5. Similar conditions existed for the remainder of the stations on the track.

The Myctophids are distributed along the whole track of stations rather evenly with the exception of station 5 (Table 4) where high concentrations were found and at station 6 where concentrations were low (Table 5). Argyropelicus spp. were only present in appreciable numbers at station 4 (Table 3) where high levels of reverberation occurred Vinciguerria attenuata was present at stations 5, 6, and 9 (Tables 4, 5, and 8) but only in large concentrations at station 5 where it contributed or was responsible for the highest levels of reverberation found in these stations.

Although the biological and acoustical data do seem to corroborate each other, a greater amount of information would have been gained if a multiple sampling net had been utilized. Concentrations and exact species depth distributions could have been assessed accurately. The migrating and non-migrating constituents of the DSL could have been distinguished from one another, and the possible contribution to scattering of the non-fish population might have been recognized.

From the data of swim bladder size and concentration of fish, calculations of scattering strengths will be made and compared with those obtained in real time.

David F. Giuliano
DAVID F. GIULIANO
Biological Oceanographer

BIBLIOGRAPHY

Backus, R. H. and J. B. Hersey, The Geographic Variation of Midwater Scattering (U), Woods Hole Oceanographic Institute Reference No. 66-14, March 1966 (C)

Dullea, R. K. and B. F. Cron (1969) Acoustical Investigation of the Deep Scattering Layer for Specific Locations in the Atlantic and Pacific Ocean NUSL Report No. 960.

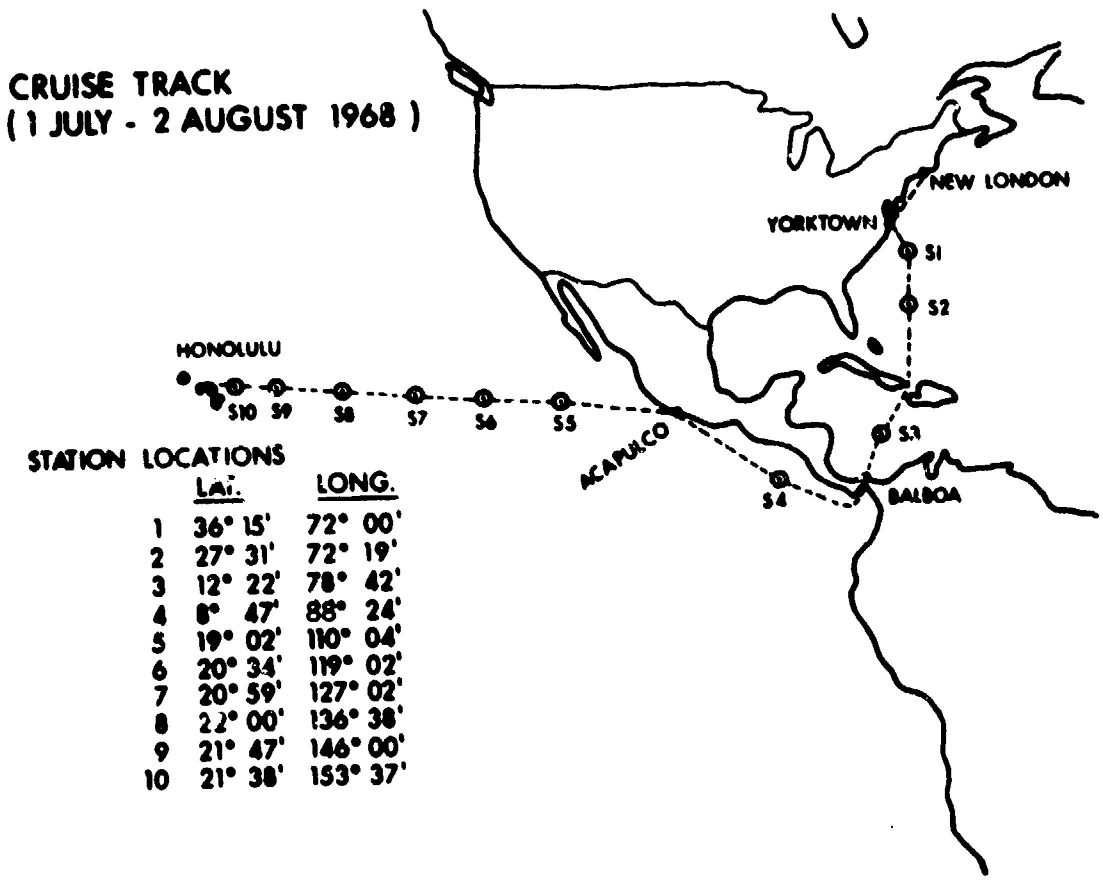

Fig. 1 - Geographical Location of the Test Stations

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
1	0-850	194,250	*Chauliodus sloani*	3	.015	80 mm, 95mm, 29 cm.		Daytime Tow
			Malacosteidae	1	.005	10 cm.		
			Gonostoma elongatum	2	.010	20, 16.5 cm.		Fat filled swim bladder
			Cyclothone spp.			1.4 - 2.5 cm $\bar{x}$ = 1.6		
			Myctophidae	16	.08	18-65 mm $\bar{x}$ = 35 mm		
			Argyropelicus sp.	2	.010	10.58 mm		Hatchetfish
			Sternoptyx sp.	3	.015	32-36 mm $\bar{x}$ 35mm		Hatchetfish
			Sergestidae	7	.036	$\bar{x}$ = 5.1 cm		Prawn
			Peneidae	8	.041	$\bar{x}$ = 1.5 cm		Prawn
			Decapoda	4	.021	$\bar{x}$ = 4.5 cm		Scarlet prawns
			Euphausiidacea	6	.031	$\bar{x}$ = 1.5 cm		
			Amphipoda	10	.051	$\bar{x}$ = 2.6 cm		

TABLE 1

Animal Abundance at Station 1

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
2	0-200	170,940	Myctophidae	27	.158	10-55mm $\bar{x}$ = 28 mm	$\bar{x}$=3mmx1mm	
			Unknown fish	8	.647	6-135mm		
			Leptocephalus	2	.012			Eel larvae
			Cephalopoda	3	.018	60 mm, 19 mm 25 cm		Squid
			Decapoda	11	.064	$\bar{x}$ = 34 mm		Caridean Prawns
			Euphausiidacea	8	.047	$\bar{x}$ = 12 mm		

TABLE 2

Animal Abundance at Station 2

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
4	0-150	186,480	*Argyropelecis sp.*	211	1.13	26-65 mm $\bar{x}$ = 43 mm	$\bar{x}$=3.5x4.5mm	
			Myetophidae	31	.166	35-85 mm $\bar{x}$ = 47 mm	$\bar{x}$=2.5x1.0mm	
			Vinciguerria spp.	15	.080	15-40mm $\bar{x}$ = 27 mm	$\bar{x}$=3x1.5mm	
			Chauliodus sloani	2	.010	85, 105 mm		
			Unknown Stomiatoid	9	.048	$\bar{x}$ = 50 mm		
			Unknown fish	52	.279	$\bar{x}$ = 14mm		
			Cephalopoda	11	.051	$\bar{x}$ =60mm		Squid
			Squilla sp.	10	.053	$\bar{x}$ = 25mm		
			Decapoda			$\bar{x}$ = 22mm		Red Prawn
			Euphausiidacea			$\bar{x}$ = 12mm		
			Pleurencodtes planipes	3	.016	$\bar{x}$ = 12mm		Galatheid Crab

TABLE 3

Animal Abundance at Station 4

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
5	0-110	186,480	Vinciquerria attenuata	953	5.11	22-45mm $\bar{x}$ = 33mm	3x2mm	
			Myctophidae	93	.499	25-72 $\bar{x}$ = 55	$\bar{x}$ = 1.25 x 2.6mm	
			Chauliodus sloani	3	.016			
			Unknown fish	8	.043			
			Pleurencoides planipes	2,887	15.48			Galatheid Crab
			Euphausiidacea	504	2.70			

TABLE 4

Animal Abundance at Station 5

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
6	0-120	233,100	Vinciquerria attenuata	73	.313	12-59mm $\bar{x}$=45mm	$\bar{x}$=1x5mm	
			Myctophidae	22	.094	22-65 $\bar{x}$=35mm	$\bar{x}$=2x9mm	
			Argyropelicus	3	.013	40, 21, 21mm	4x3mm 2x1.7mm	
			Unknown bladdered fish	7	.030	$\bar{x}$=35mm	$\bar{x}$=1.6x7mm	
			Unknown fish	9	.039	50-125mm $\bar{x}$=70mm		
			Pleurencotes planipes	93	.399	$\bar{x}$=25mm		
			Eucopia sp.	5	.021	$\bar{x}$=35mm		
			Euphausiidacea	42	.180	$\bar{x}$=15mm		
			Deep-sea Cephalopods	3	.013	50-80mm		
			Cephalopods	2	.009	30mm		

TABLE 5

Animal Abundance at Station 6

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
7	0-100	217,560	Myctophidae	72	.331	18-60mm $\bar{x}$=40mm	2x7mm	
			Melanostomatoid	3	.014	80-140mm		
			Unknown fish	9	.041	12-30mm		
			Cephalopods	5	.023	1-3.25cm		
			Euphausiidacea	26	.120	1-4cm $\bar{x}$=1.5cm		
			Peneidae	54	.248	1-3.8cm $\bar{x}$=2cm		

TABLE 6

Animal Abundance at Station 7

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
8	0-100	186,480	Myetophidae	43	.23	$\bar{x}=50$	1 x 5mm	
			Unknown fish	5	.027	35-130mm		
			Cephalopoda	12	.064	20-50mm		
			Euphausiidacea	36	.193	$\bar{x}=20$		

TABLE 7

Animal Abundance at Station 8

Station No.	Tow Depth Range (m)	No. m^3 H_2O Filtered	Species	No. Caught	No. per $1000 m^3$ H_2O Filtered	Size Range and Mean Size	Bladder Mean Size	Remarks
9	0-100	186,480	Myctophidae	41	.220	16-65mm $\bar{x}$ = 30mm	$\bar{x}$=.5x3mm	
			Vinciquerria attenuata	5	.027	$\bar{x}$=15mm		
			Pleurencotes planipes	8	.043			
			Squilla sp.	14	.075	20-50mm		
			Euphausiidacea	16	.086			
			Decapoda	18	.097			
			Panulirus larvae	4	.022	28-51		

TABLE 8

Animal Abundance at Station 9

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

IN REPLY REFER TO
5510/1
Ser 93/160
10 Mar 99

From: Chief of Naval Research
To: Commander, Naval Meteorology and Oceanography Command
1020 Balch Boulevard
Stennis Space Center MS 39529-5005

Subj: DECLASSIFICATION OF PARKA I AND PARKA II REPORTS

Ref: (a) CNMOC ltr 3140 Ser 5/110 of 12 Aug 97

Encl: (1) Listing of Known Classified PARKA Reports

1. In response to reference (a), the Chief of Naval Operations (N874) has reviewed a number of Pacific Acoustic Research Kaneohe-Alaska (PARKA) Experiment documents and has determined that all PARKA I and PARKA II reports may be declassified and marked as follows:

   Classification changed to UNCLASSIFIED by authority of Chief of Naval Research letter Ser 93/160, 10 Mar 99.

   DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited.

2. Enclosure (1) is a listing of known classified PARKA reports. The marking on those documents should be changed as noted in paragraph 1 above. When other PARKA I and PARKA II reports are identified, their markings should be changed and a copy of the title page and a notation of how many pages the document contained should be provided to Chief of Naval Research (ONR 93), 800 N. Quincy Street, Arlington, VA 22217-5660. This will enable me to maintain a master list of downgraded PARKA reports.

3. Questions may be directed to the undersigned on (703) 696-4619, DSN 426-4619.

Peggy Lambert

PEGGY LAMBERT
By direction

Copy to:
NUWC Newport Technical Library (Code 5441)
NRL Washington (Mary Templeman, Code 5227)
NRL SSC (Roger Swanton, Code 7031)
✓DTIC (Bill Bush, DTIC-OCQ)

LISTING OF KNOWN CLASSIFIED PARKA REPORTS

Operation Plan, Pacific Acoustic Research Kaneohe-Alaska PARKA Experiment, Undated, ONR, 48 pages
(NUSC NL Accession # 49531)

Fleet Research Project 109 PARKA II, Undated, COMASWFORPAC-OPORD-303-69, Antisubmarine Warfare Force, Pacific Fleet, Unknown # of pages
(NUSC NL Accession # 093561)

Preliminary Operation Plan Pacific Acoustic Research Kaneohe-Alaska PARKA Experiment, June 1968, ONR, Unknown # of pages
(NUSC NL Accession # 023063)

LRAPP Briefing Report on the PARKA Series, May 1969, MC Report 001, Maury Center for Ocean Science (ONR), 20 pages
(NUSC NL Accession # 023375)

Bathythermograph Traces from PARKA, 20 May 1969, NUSL-TM-2213-118-69, 7 pages
(DTIC # B952 259)

Bathymetric Strip Charts in the North Pacific Ocean for Project PARKA II, 20 June 1969, Naval Oceanographic Office, Unknown # of pages
(NUSC NL Accession # 051659)

PARKA II Experiment Utilizing Sea Spider ONR Scientific Plan 2-69, 26 June 1969, MC-PLAN-01, 172 pages
(DTIC # B020 846)

PARKA I - Acoustic Processing and Results, 28 July 1969, USL Technical Memorandum No. 2210-015-69, NUSC New London, 115 pages
(NUSC NL Accession # 202993-001) (NRL SSC Accession # 85009134)

A Scheduled At-Sea Simulation of Adaptive Beamforming, 19 September 1969, NUSL-TM-2211-162-69, 23 pages
(DTIC # B026 991)

Biological Data Collected on the PARKA I Transit, 23 October 1969, NUSL-TM-2213-262-69, 15 pages
(DTIC # B952 263)

PARKA I Experiment, November 1969, MC Report 003, Volume 1, Maury Center for Ocean Science (ONR), 84 pages
(NRL Accession # 466930) (NRL SSC Accession # 85004881) (DTIC # 506 209)